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| 09/382,182 | 08/24/1999 | YOSHIO HAGIWARA | 12052.20US01 | 4904 |

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MERCHANT & GOULD PC
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

EXAMINER

GOUDREAU, GEORGE A

ART UNIT PAPER NUMBER

1763

DATE MAILED: 08/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09-382,182

Applicant(s)

Hagiwara

Examiner

George Goudreau

Group Art Unit

1763

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- ☒ Responsive to communication(s) filed on 5-27-03 (i.e., paper #15)
- ☒ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- ☒ Claim(s) 1, 4-10 is/are pending in the application.
- Of the above claim(s) _____ is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 1, 4-10 is/are rejected.
- ☐ Claim(s) _____ is/are objected to.
- ☐ Claim(s) _____ are subject to restriction or election requirement

Application Papers

- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☐ The drawing(s) filed on _____ is/are objected to by the Examiner
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

- ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).
- ☒ All ☐ Some* ☐ None of the:
- ☒ Certified copies of the priority documents have been received.
- ☐ Certified copies of the priority documents have been received in Application No. _____
- ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____

Attachment(s)

- ☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____
- ☐ Interview Summary, PTO-413
- ☐ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Other _____

Office Action Summary

1. Claims 1, and 4-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

-Applicant has incorrectly attempted to recycle a canceled claim number, when applicant adds claim 3 in amendment D. (Applicant previously canceled claim 3 in amendment C. Once a claim number has been canceled in an application, it cannot be reused or recycled. Claim 3 is therefore not entered of record in the file.);

-The wording used in the first two paragraphs of claims 1, 4, 9, is very confusing. (In these claims applicant recites that "...the resist mask on a silica based insulating film between layers having dielectric constant being equal to or less than 3.5..." Applicant appears to really mean to state that the resist film is formed over a silica based insulating film which has a dielectric constant less than or equal to 3.5, and is sandwich between two SiO₂ layers. The examiner bases this statement upon applicant's arguments, and applicant's specification which are also written in a very confusing manner. Further, the resist film is not formed on the silica based insulating film but over it since SiO₂ films rest on either side of the silica based insulating film. Also, the silica based insulating film has a dielectric constant less than or equal to 3.5 (i.e.-a low dielectric material), and not the SiO₂ films which are located on either side of the silica based insulating film which have dielectric constants greater than 4.0.);

-The term "or" in the last line of claim 1, should read "on".; and

-The term "resis" in line 5 of claim 1, should read "resist".

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, and 4-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu (6,387,819).

Yu discloses a process for making a Cu dual damascene structure on a wafer which is comprised of the following steps:

- A laminate of SiO₂ (115)/a low K dielectric material (10)/SiO₂ (20) is formed onto the surface of a wafer (15). The low K dielectric material has a dielectric constant less than 3.2; and may be made out of a Si containing organic polymer as well as other materials.;
- A patterned photo resist layer (25) is formed onto the surface of the laminate.;
- The laminate is etched down to the surface of the SiO₂ layer (105) using the patterned photo resist etch mask (25) using a multi-step etching process.;
- The laminate is reshaped to form the opening for a dual damascene structure using the resist etch mask (25), and a sacrificial layer which has been deposited inside of the opening used to form the damascene structure.;
- The photo resist etch mask, and the sacrificial layer are removed from the surface of the wafer using an ashing process.;
- A Cu layer (10) is used to fill the damascene openings in the ILD layer (95) on the wafer surface to form a Cu damascene (10).

This is discussed specifically in columns 1, 4-8; and discussed in general in

columns 1-16. This is shown in figures 1-5. Yu fails, however, to specifically disclose the following aspects of applicant's claimed invention:

- the specific ashing of the photo resist etch mask using the specific process conditions which are claimed by the applicant;
- the specific methods for forming the low K dielectric layer which are claimed by the applicant; and
- the specific production of a low K dielectric with the specific dielectric constants, and C contents which are claimed by the applicant

It would have been obvious to one skilled in the art to form the SOG layers in the process taught above such that they have the specific dielectric constants, and carbon contents which are claimed by the applicant based upon the following. It would have been desirable to form the SOG layer in the process taught above such that the SOG layer provides adequate insulation between adjacent circuitry in order to prevent the undesirable cross talk between adjacent layers of circuitry.

It would have been obvious to one skilled in the art to form the SOG layers in the process taught above using the specific methods which are claimed by the applicant based upon the following. The specific methods which are claimed by the applicant for forming the SOG layer are conventional or at least well known in the semiconductor processing arts. (The examiner takes official notice in this regard.) Further, this simply represents the usage of an alternative, and at least equivalent means for forming the SOG layer in the process taught above to the specific usage of other such means.

It would have been obvious to one skilled in the art to use an O₂ plasma to ash the photo resist etch mask in the resist ashing process taught above based upon the following. The usage of an O₂ resist ashing process to strip a photo resist layer is conventional or at least well known in the resist ashing arts. (The examiner takes official notice in this regard.) Further, this simply

represents the usage of an alternative, and at least equivalent means for stripping the photo resist etch mask in the process taught above to the specific usage of other such means.

It would have been prima facie obvious to employ any of a variety of different process parameters in the O2 ashing step in the process taught above including those which are claimed by the applicant. These are all well known variables in the resist ashing art which are known to effect both the rate and quality of the resist ashing process. Further, the selection of particular values for these variables would not necessitate any undo experimentation which would be indicative of a showing of unexpected results.

Alternatively, it would have been obvious to one skilled in the art to employ the specific process parameters which are claimed by the applicant in the resist ashing process taught above based upon In re Aller as cited below.

“Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” In re Aller, 220 F. 2d 454, 105 USPQ 233, 235 (CCPA).

Further, all of the specific process parameters which are claimed by the applicant for their resist ashing step are results effective variables whose values are known to effect both the rate, and the quality of the resist ashing step.

4. Applicant's arguments filed 5-27-03' have been fully considered but they are not persuasive.

Applicant argues the following points regarding the examiner's rejection of their claimed subject matter.

-Applicant has amended all of their claims to overcome the examiner's previous 112 2nd paragraph rejection of their claimed subject matter. The application is now in a condition for allowance.

The examiner must disagree.

-Although applicant has amended all of their claims to overcome the previous 112 2nd paragraph rejection of their claims, the application is still not in a condition for allowance. This is based upon the fact that applicant has created new 112 2nd paragraph issues in the process of amending their previous claims. (See 112 2nd paragraph rejections listed above.)

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner George A. Goudreau whose telephone number is (703) -308-1915. The examiner can normally be reached on Monday through Friday from 9:30 to 6:00.

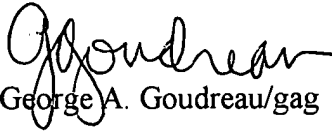
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Examiner Gregory Mills, can be reached on (703) -308-1633. The appropriate fax phone number for the organization where this application or proceeding is assigned is (703) -306-3186.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) -308-0661.

A handwritten signature in black ink, appearing to read "Goudreau".

George A. Goudreau/gag

Primary Examiner

AU 1763